CHANNEL UNITS

END-TO-END SIGNALING TESTS

This Section provides procedures for testing the signaling functions of the D448 channel units.

This Section has been reissued to add information on new channel units.

The tests in this Section are for single-channel testing on an end-to-end basis. For single-ended signaling tests using the automated test and alignment unit (ATAU), 628450, refer to Section ITTR-18-443.

The channel units covered in this Section are:

(a) 4-wire E&M (4WEM) channel unit, 628100
(b) 2-wire E&M (2WEM9 and 2WEM6) channel unit, 628120
(c) 2-wire E&M with A and B leads (2WEM9A and 2WEM6A) channel unit, 628130
(d) 2-wire dial pulse originating (DPO9 and DPO6) channel unit, 628140
(e) 3-wire dial pulse originating (SDPO9 and SDPO6) channel unit, 628150
(f) 3-wire dial pulse originating with calling party forced release (SDPOC9 and SDPOC6), channel unit, 628155
(g) 2-wire dial pulse terminating (DPT9 and DPT6) channel unit, 628160
(h) 2-wire dial pulse terminating with integrity check (DPT9I and DPT6I) channel unit, 628170
(i) 2-wire foreign exchange office (2WFXO9 and 2WFXO6) channel unit, 628180
(j) 2-wire foreign exchange office with loop start (2WFXO/LS9 and 2WFXO/LS6) channel unit, 628184
(k) 2-wire foreign exchange subscriber (2WFXS9 and 2WFXS6) channel unit, 628190

WARNING: This equipment contains static-sensitive (CMOS) devices. Section ITTR-18-599 contains handling instructions for CMOS-equipped units.

The charts in this Section are titled to indicate the channel units at each end of the system. You should use the chart with the appropriate channel units listed.

When performing the tests in this Section, one end of the system should be designated the sending end and the other designated the receiving end. These designations are to remain constant throughout the test. Note that all actions described take place at the sending end (i.e., the sending end controls the action in the test). Even though some action must of course be taken at the receiving end, it is the sending end that instructs the receiving end as to what actions to take. When different types of channel units are used at each end, the sending end and receiving end are also identified by the channel unit (i.e., DPO end, 2WEM end, 2WFXS end, etc.).

The card jack/310 adapter cord (ITT Part No. 600397-540-003), which is used in these tests, is shown in Fig. 1.

It is necessary to use Section ITTR-18-440 during some tests because some options may require changing during the test. This Section should be readily available while performing the tests.

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1—4WEM Channel Unit, 628100, or 2WEM Channel Unit, 628120 or 628130, Signaling Test 3

2—DPO Channel Unit, 628140, to DPT Channel Unit, 628160 or 628170, Signaling Test 4

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3—DPO Channel Unit, 628140, to 4WEM Channel Unit, 628100, or 2WEM Channel Unit, 628120 or 628130, Signaling Test 6

4—SDPO Channel Unit, 628150, and SDPOC Channel Unit, 628155, to DPT Channel Unit, 628160 or 628170, Signaling Test 7

5—SDPO Channel Unit, 628150, and SDPOC Channel Unit, 628155, to 4WEM Channel Unit, 628100, or 2WEM Channel Unit, 628120 or 628130, Signaling Test 9

6—DPT Channel Unit, 628160 or 628170, to 4WEM Channel Unit, 628100, or 2WEM Channel Unit, 628120 or 628130, Signaling Test 11

7—2WFXO Channel Unit, 628180, and 2WFXO/LS Channel Unit, 628184, to 2WFXS Channel Unit, 628190, Signaling Test 13

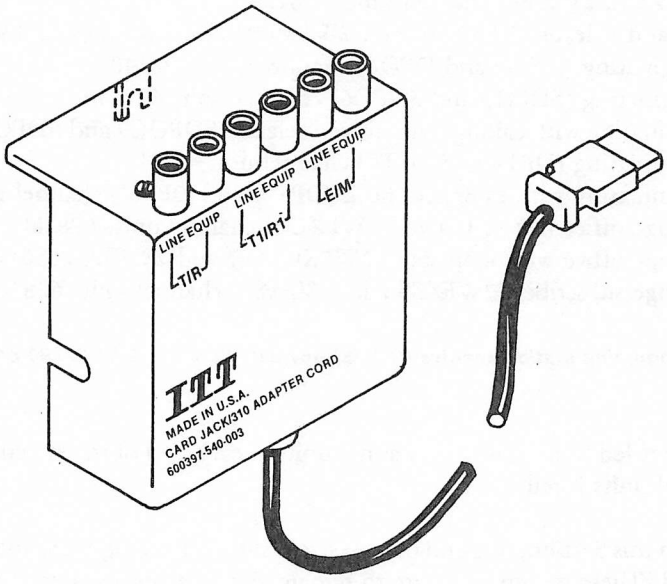

Fig. 1—Card Jack/310 Adapter Cord

CHART 1

4WEM CHANNEL UNIT, 628100, OR 2WEM CHANNEL UNIT, 628120 OR 628130, SIGNALING TEST

APPARATUS (REQUIRED AT EACH END):

1—Volt-ohm meter (VOM) (WE KS-14510, Triplett 630, or equivalent)

1—Pulse signaling test set (Northeast TTS26B or equivalent)

1—Card jack/310 adapter cord (ITT Part No. 600397-540-003)

Standard hand tools as required (see Section ITTR-18-400)

STEP	PROCEDURE
	Note 1: The pulse signaling test set should be set up and test connections made as instructed by the manufacturer.
	Note 2: If any requirement in this procedure is not met, refer to Section ITTR-18-543 for trouble location procedures.
1	Select option screw [E] on channel unit. Instruct receiving end to do same.
2	Insert card jack/310 adapter cord in channel unit splitting card jack. Instruct receiving end to do same.
3	Using pulse signaling test set, apply ground/battery pulsing at 12 pps, 60% break to LINE M test point on card jack/310 adapter cord.
4	Instruct receiving end to measure percent break at LINE E test point on card jack/310 adapter cord using pulse signaling test set.
	Requirement: Percent break is 58 to 62%. E LED at receiving end flashes with dial pulsing.
5	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
6	Reverse sending end and receiving end designations and repeat Steps 3 through 5.
7	Instruct receiving end to set VOM to ohms scale and connect it across LINE E test point on card jack/310 adapter cord and GND test point on power converter unit (PCU) in multiplex terminal.
	Requirement: VOM reads infinite ohms. E LED should be off.
8	Apply −48 Vdc office battery to LINE M test point on card jack/310 adapter cord.
	Requirement: VOM at receiving end reads approximately zero ohms. E LED is on.
9	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.

CHART 1 (Cont)

STEP	PROCEDURE
10	Reverse sending end and receiving end designations and repeat Steps 7 through 9.
11	Remove card jack/310 adapter cord from channel unit. Instruct receiving end to do same.
12	Restore options on channel unit to proper settings for local requirements. Instruct receiving end to do same.
	Note: The channel is now ready for service.

CHART 2

DPO CHANNEL UNIT, 628140, TO DPT CHANNEL UNIT, 628160 OR 628170, SIGNALING TEST

APPARATUS (REQUIRED AT EACH END):

1—Volt-ohm meter (VOM) (WE KS-14510, Triplett 630, or equivalent)

1—Pulse signaling test set (Northeast TTS26B or equivalent)

1—Card jack/310 adapter cord (ITT Part No. 600397-540-003)

Standard hand tools as required (see Section ITTR-18-400)

STEP	PROCEDURE
	Note 1: This procedure is referenced from the DPO end (i.e., the DPO end is the sending end and controls the action in this procedure).
	Note 2: The pulse signaling test set should be set up and test connections made as instructed by the manufacturer.
	Note 3: If any requirement in this procedure is not met, refer to Section ITTR-18-543 for trouble location procedures.
1	Insert card jack/310 adapter cord in channel unit splitting card jack. Instruct receiving end to do same.
2	Using pulse signaling test set, apply loop pulsing at 12 pps, 68% break with 600-ohm loop resistance and 600-ohm plus 2-uF leak resistance to LINE T and LINE R test points on card jack/310 adapter cord.
3	Instruct receiving end to measure percent break (through meter relay) at LINE T and LINE R test points on card jack/310 adapter cord using pulse signaling test set.
	Requirement: Percent break is 66% maximum. LC LEDs at both ends flash with dial pulsing.

CHART 2 (Cont)

STEP	PROCEDURE
4	At sending end, reconfigure pulse signaling test set to send loop pulsing at 12 pps, 58% break with 0-ohm loop resistance and 600-ohm plus 2-uF leak resistance. ***Requirement:*** At receiving end, percent break is 45% minimum. LC LEDs at both ends flash with dial pulsing.
5	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same. ***WARNING: Do not use – 48V test point on PCU in multiplex terminal as a battery supply for the following steps. A limiting resistor in the test point circuit will drop excessive voltage when connected to a DPT channel unit.***
6	With VOM set to volts dc scale, connect it across LINE T and LINE R test points on card jack/310 adapter cord.
7	Instruct receiving end to apply normal battery to LINE T and LINE R test points on card jack/310 adapter cord. ***Requirement:*** VOM reads normal battery.
8	Instruct receiving end to apply reverse battery to LINE T and LINE R test points on card jack/310 adapter cord. ***Requirement:*** VOM reads reverse battery.
9	Remove test connections from card jack/310 adapter cord and card jack/310 adapter cord from channel unit. Instruct receiving end to do same. ***Note:*** The channel is now ready for service.

CHART 3

DPO CHANNEL UNIT, 628140, TO 4WEM CHANNEL UNIT, 628100, OR 2WEM CHANNEL UNIT, 628120 OR 628130, SIGNALING TEST

APPARATUS (REQUIRED AT EACH END):

1—Volt-ohm meter (VOM) (WE KS-14510, Triplett 630, or equivalent)

1—Pulse signaling test set (Northeast TTS26B or equivalent)

1—Card jack/310 adapter cord (ITT Part No. 600397-540-003)

Standard hand tools as required (see Section ITTR-18-400)

STEP	PROCEDURE
	Note 1: This procedure is referenced from the DPO end (i.e., the DPO end is the sending end and controls the action in this procedure).
	Note 2: The pulse signaling test set should be set up and test connections made as instructed by the manufacturer.
	Note 3: If any requirement in this procedure is not met, refer to Section ITTR-18-543 for trouble location procedures.
1	Instruct receiving end to select option screw [E] on channel unit.
2	Insert card jack/310 adapter cord in channel unit splitting card jack. Instruct receiving end to do same.
3	Using pulse signaling test set, apply loop pulsing at 12 pps, 68% break with 600-ohm loop resistance and 600-ohm plus 2-uF leak resistance to LINE T and LINE R test points on card jack/310 adapter cord.
4	Instruct receiving end to measure percent break at LINE E test point on card jack/310 adapter cord using pulse signaling test set.
	Requirement: Percent break is 66%. LC LED on DPO and E LED on 4WEM or 2WEM flash with dial pulsing.
5	At sending end, reconfigure pulse signaling test set to send loop pulsing at 12 pps, 58% break with 0-ohm loop resistance and 600-ohm plus 2-uF leak resistance.
	Requirement: At receiving end, percent break is 45% minimum. LC LED on DPO and E LED on 4WEM or 2WEM flash with dial pulsing.
6	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
7	With VOM set to volts dc scale, connect it across LINE T and LINE R test points on card jack/310 adapter cord.
	Requirement: VOM reads normal battery.

CHART 3 (Cont)

STEP	PROCEDURE
8	Instruct receiving end to apply office battery to LINE M test point on card jack/310 adapter cord. ***Requirement:*** VOM reads reverse battery.
9	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
10	Instruct receiving end to set VOM to ohms scale and connect it across LINE E test point on card jack/310 adapter cord and GND test point on PCU in multiplex terminal. ***Requirement:*** VOM reads infinite ohms.
11	Short LINE T and LINE R test points on card jack/310 adapter cord together. ***Requirement:*** VOM at receiving end reads zero ohms.
12	Remove test connections from card jack/310 adapter cord and card jack/310 adapter cord from channel unit. Instruct receiving end to do same.
13	Instruct receiving end to restore options on channel unit to proper settings for local requirements. ***Note:*** The channel is now ready for service.

CHART 4

SDPO CHANNEL UNIT, 628150, AND SDPOC CHANNEL UNIT, 628155, TO DPT CHANNEL UNIT, 628160 OR 628170, SIGNALING TEST

APPARATUS (REQUIRED AT EACH END):

1—Volt-ohm meter (VOM) (WE KS-14510, Triplett 630, or equivalent)

1—Pulse signaling test set (Northeast TTS26B or equivalent)

1—Card jack/310 adapter cord (ITT Part No. 600397-540-003)

Standard hand tools as required (see Section ITTR-18-400)

STEP	PROCEDURE
	Note 1: This procedure is referenced from the SDPO or SDPOC end (i.e., the SDPO or SDPOC end is the sending end and controls the action in this procedure). ***Note 2:*** The pulse signaling test set should be set up and test connections made as instructed by the manufacturer.

CHART 4 (Cont)

STEP	PROCEDURE
	Note 3: If any requirement in this procedure is not met, refer to Section ITTR-18-543 for trouble location procedures.
1	Select option screws [B], [3W], and [S]. Turn up option screws [W] and [U1].
2	Insert card jack/310 adapter cord in channel unit splitting card jack. Instruct receiving end to do same.
3	Using pulse signaling test set, apply loop pulsing at 12 pps, 64% break with 1500-ohm loop resistance to LINE T and LINE R test points on card jack/310 adapter cord.
4	Instruct receiving end to measure percent break (through meter relay) at LINE T and LINE R test points on card jack/310 adapter cord using pulse signaling test set. ***Requirement:*** Percent break is 65% maximum. LC LEDs at both ends flash with dial pulsing.
5	At sending end, reconfigure pulse signaling test set to send loop pulsing at 12 pps, 58% break with 0-ohm loop resistance and an A-leak network. ***Requirement:*** At receiving end, percent break is 40% minimum. LC LEDs at both ends flash with dial pulsing.
6	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same. ***WARNING: Do not use – 48V test point on PCU in multiplex terminal as a battery supply for the following steps. A limiting resistor in the test point circuit will drop excessive voltage when connected to a DPT channel unit.***
7	With VOM set to volts dc scale, connect it across LINE T and LINE R test points on card jack/310 adapter cord.
8	Instruct receiving end to apply normal battery to LINE T and LINE R test points on card jack/310 adapter cord. ***Requirement:*** VOM reads normal battery.
9	Instruct receiving end to apply reverse battery to LINE T and LINE R test points on card jack/310 adapter cord. ***Requirement:*** VOM reads reverse battery.
10	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
11	With VOM set to volts dc scale, connect its + probe to LINE E test point on card jack/310 adapter cord (accesses S lead on SDPO or SDPOC) and its – probe to – 48V test point on PCU in multiplex terminal. ***Requirement:*** VOM reads zero volts.

CHART 4 (Cont)

STEP	PROCEDURE
12	Short LINE T and LINE R test points on card jack/310 adpater cord together. ***Requirement:*** VOM reads 48 Vdc.
13	Remove test connections from card jack/310 adapter cord and card jack/310 adapter cord from channel unit. Instruct receiving end to do same.
14	Restore options on channel unit to proper settings for local requirements. ***Note:*** The channel is now ready for service.

CHART 5

SDPO CHANNEL UNIT, 628150, AND SDPOC CHANNEL UNIT, 628155, TO 4WEM CHANNEL UNIT, 628100, OR 2WEM CHANNEL UNIT, 628120 OR 628130, SIGNALING TEST

APPARATUS (REQUIRED AT EACH END):

1—Volt-ohm meter (VOM) (WE KS-14510, Triplett 630, or equivalent)

1—Pulse signaling test set (Northeast TTS26B or equivalent)

1—Card jack/310 adapter cord (ITT Part No. 600397-540-003)

Standard hand tools as required (see Section ITTR-18-400)

STEP	PROCEDURE
	Note 1: This procedure is referenced from the SDPO or SDPOC end (i.e., the SDPO or SDPOC end is the sending end and controls the action in this procedure). ***Note 2:*** The pulse signaling test set should be set up and test connections made as instructed by the manufacturer. ***Note 3:*** If any requirement in this procedure is not met, refer to Section ITTR-18-543 for trouble location procedures.
1	Select option screws [B], [3W], and [S]. Turn up option screws [W] and [U1].
2	Instruct receiving end to select option screw [E] on channel unit.
3	Insert card jack/310 adapter cord in channel unit splitting card jack. Instruct receiving end to do same.

CHART 5 (Cont)

STEP	PROCEDURE
4	Using pulse signaling test set, apply loop pulsing at 12 pps, 64% break with 1500-ohm loop resistance to LINE T and LINE R test points on card jack/310 adapter cord.
5	Instruct receiving end to measure percent break at LINE E test point on card jack/310 adapter cord using pulse signaling test set. ***Requirement:*** Percent break is 65% maximum. LC LED on SDPO or SDPOC and E LED on 4WEM or 2WEM flash with dial pulsing.
6	At sending end, reconfigure pulse signaling test set to send loop pulsing at 12 pps, 58% break with 0-ohm loop resistance and an A-leak network. ***Requirement:*** At receiving end, percent break is 40% minimum. LC LED on SDPO or SDPOC and E LED on 4WEM or 2WEM flash with dial pulsing.
7	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
8	With VOM set to volts dc scale, connect it across LINE T and LINE R test points on card jack/310 adapter cord. ***Requirement:*** VOM reads normal battery.
9	Instruct receiving end to apply office battery to LINE M test point on card jack/310 adapter cord. ***Requirement:*** VOM reads reverse battery.
10	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
11	Instruct receiving end to set VOM to ohms scale and connect it across LINE E test point on card jack/310 adapter cord and GND test point on PCU in multiplex terminal. ***Requirement:*** VOM reads infinite ohms.
12	Short LINE T and LINE R test points on card jack/310 adapter cord together. ***Requirement:*** VOM at receiving end reads approximately zero ohms.
13	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
14	With VOM set to volts dc scale, connect its + probe to LINE E test point on card jack/310 adapter cord (accesses S lead on SDPO or SDPOC) and its – probe to –48V test point on PCU in multiplex terminal. ***Requirement:*** VOM reads zero volts.

CHART 5 (Cont)

STEP	PROCEDURE
15	Short LINE T and LINE R test points on card jack/310 adapter cord together. ***Requirement:*** VOM reads +48 Vdc.
16	Remove test connections from card jack/310 adapter cord and card jack/310 adapter cord from channel unit. Instruct receiving end to do same.
17	Restore options on channel unit to proper settings for local requirements. Instruct receiving end to do same. ***Note:*** The channel is now ready for service.

CHART 6

DPT CHANNEL UNIT, 628160 OR 628170, TO 4WEM CHANNEL UNIT, 628100, OR 2WEM CHANNEL UNIT, 628120 OR 628130, SIGNALING TEST

APPARATUS (REQUIRED AT EACH END):

1—Volt-ohm meter (VOM) (WE KS-14510, Triplett 630, or equivalent)

1—Pulse signaling test set (Northeast TTS26B or equivalent)

1—Card jack/310 adapter cord (ITT Part No. 600397-540-003)

Standard hand tools as required (see Section ITTR-18-400)

STEP	PROCEDURE
	Note 1: This procedure is referenced from the 4WEM or 2WEM end (i.e., the 4WEM or 2WEM end is the sending end and controls the action in this procedure). ***Note 2:*** The pulse signaling test set should be set up and test connections made as instructed by the manufacturer. ***Note 3:*** If any requirement in this procedure is not met, refer to Section ITTR-18-543 for trouble location procedures.
1	Select option screw [E] on channel unit.
2	Insert card jack/310 adapter cord in channel unit splitting card jack. Instruct receiving end to do same.
3	Using pulse signaling test set, apply ground/battery pulsing at 12 pps, 60% break LINE M test point on card jack/310 adapter cord.

CHART 6 (Cont)

STEP	PROCEDURE
4	Instruct receiving end to measure percent break (through meter relay) at LINE T and LINE R test points on card jack/310 adapter cord using pulse signaling test set. ***Requirement:*** Percent break is between 57 and 63%. E LED on 4WEM or 2WEM and LC LED on DPT flash with dial pulsing.
5	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same. ***WARNING: Do not use – 48V test point on PCU in multiplex terminal as a battery supply for the following steps. A limiting resistor in the test point circuit will drop excessive voltage when connected to a DPT channel unit.***
6	Instruct receiving end to apply reverse battery to LINE T and LINE R test points on card jack/310 adapter cord.
7	Set VOM to ohms scale and connect it across LINE E test point on card jack/310 adapter cord and GND test point on PCU in multiplex terminal. ***Requirement:*** VOM reads approximately zero ohms.
8	Instruct receiving end to apply normal battery to LINE T and LINE R test points on card jack/310 adapter cord. ***Requirement:*** VOM reads infinite ohms.
9	Remove test connections from card jack/310 adapter cord and card jack/310 adapter cord from channel unit. Instruct receiving end to do same.
10	Restore options on channel unit to proper settings for local requirements. ***Note:*** The channel is now ready for service.

CHART 7

2WFXO CHANNEL UNIT, 628180, AND 2WFXO/LS CHANNEL UNIT, 628184, TO 2WFXS CHANNEL UNIT, 628190, SIGNALING TEST

APPARATUS (REQUIRED AT EACH END):

1—Volt-ohm meter (VOM) (WE KS-14510, Triplett 630, or equivalent)

1—Pulse signaling test set (Northeast TTS26B or equivalent)

1—Card jack/310 adapter cord (ITT Part No. 600397-540-003)

STEP	PROCEDURE
	Note 1: This procedure is referenced from the 2WFXS end (i.e., the 2WFXS end is the sending end and controls the action in this procedure).
	Note 2: The pulse signaling test set should be set up and test connections made as instructed by the manufacturer. Ensure that system and test grounds are connected.
	Note 3: If any requirement in this procedure is not met, refer to Section ITTR-18-543 for trouble location procedures.
1	Insert card jack/310 adapter cord in channel unit splitting card jack. Instruct receiving end to do same.
2	Using pulse signaling test set, apply loop pulsing at 12 pps, 64% break with 1500-ohm loop resistance to LINE T and LINE R test points on card jack/310 adapter cord.
3	Instruct receiving end to measure percent break (through meter relay) at LINE T and LINE R test points on card jack/310 adapter cord using pulse signaling test set.
	Requirement: Percent break is 69% maximum. LC LEDs at both ends flash with dial pulsing.
4	At sending end, reconfigure pulse signaling test set to send loop pulsing at 12 pps, 58% break with 0-ohm loop resistance and an A-leak network.
	Requirement: At receiving end, percent break is 43% minimum. LC LEDs at both ends flash with dial pulsing.
5	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
6	Set VOM to volts ac scale and connect it across LINE T and LINE R test points on card jack/310 adapter cord.
7	Apply ringing to 2WFXO or 2WFXO/LS.
	Requirement: VOM reads ringing voltage.

CHART 7 (Cont)

STEP	PROCEDURE
8	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same. ***Note:*** If channel is being operated ground-start, proceed to Step 9. If channel is being operated loop-start, the channel is ready for service.
9	Set VOM to volts dc scale and connect it across LINE T test point on card jack/310 adapter cord and – 48V test point on PCU in multiplex terminal. ***Requirement:*** VOM reads zero volts.
10	Instruct far end to short LINE T test point on card jack/310 adapter cord to GND test point on PCU in multiplex terminal. ***Requirement:*** VOM reads 48 Vdc.
11	Remove test connections from card jack/310 adapter cord. Instruct receiving end to do same.
12	Instruct receiving end to set VOM to volts dc scale and connect it across LINE R test point on card jack/310 adapter cord and – 48V test point on PCU in multiplex terminal. ***Requirement:*** VOM reads zero volts.
13	Short LINE R test point on card jack/310 adapter cord to GND test point on PCU in multiplex terminal. ***Requirement:*** VOM at receiving end reads 48 Vdc.
14	Remove test connections from card jack/310 adapter cord and card jack/310 adapter cord from channel unit. Instruct receiving end to do same.
15	This completes this procedure. The channel is now ready for service.